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The illegal hunting and exploitation of porcupines for meat and medicine in Indonesia

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Abstract

Indonesia is home to five species of porcupines, three of which are island endemics. While all five species are currently assessed as Least Concern by the IUCN Red List of Threatened Species, impacts of harvest and trade have not been factored in. To gain a fuller understanding of the porcupine trade in Indonesia, this study examines seizure data of porcupines, their parts and derivatives from January 2013 to June 2020. A total of 39 incidents were obtained amounting to an estimated 452 porcupines. Various confiscated commodities revealed porcupines are traded for consumption, traditional medicine, trophies/charms as well as for privately run wildlife/recreational parks. Targeted hunting of porcupines for commercial international trade was also evident. Porcupines are also persecuted as agricultural pests and wildlife traffickers take advantage of such situations to procure animals for trade. What clearly emerges from this study is that porcupines are being illegally hunted and exploited throughout their range in Indonesia facilitated by poor enforcement and legislative weakness. Porcupines are in decline due to habitat loss, retaliatory killings and uncontrolled poaching. It is therefore crucial that effective conservation measures are taken sooner rather than later to prevent further depletion of these species. Including all porcupines as protected species under Indonesian wildlife laws and listing them in Appendix II of CITES to improve regulation, enforcement and monitoring of domestic and international trade trends involving porcupines in Indonesia would contribute significantly towards this end.

Keywords

Illegal wildlife trade, seizures, traditional medicine, wildlife consumption

Introduction

Commercial exploitation of wildlife for meat and medicine has become a significant threat to species globally (Byard 2016; Nijman and Bergin 2017; Ripple et al. 2019; Gomez et al. 2020; WAP 2020). The wildlife meat and traditional medicine industries are worth billions of dollars annually and have little to do with subsistence needs – case in point being the continued demand and illegal trade in tigers, rhinos and pangolins (C4ADS 2020; Four Paws 2020; WJC 2020). For example, the legal bear bile trade in China alone is valued at USD1 billion a year and a variety of bear bile products (pills, powders, ointments, wines, tea, etc) were created to stimulate market demand (WAP 2020). Viewed as highly valuable commodities, species are hunted to the brink of their existence and as one species dwindles, it is replaced by another e.g. with wild tigers in Asia near depletion, lions in Africa, jaguars in South America and leopards worldwide are increasingly targeted as traditional medicine substitutes (Coals et al. 2020; Morgan et al. 2021); similarly, pangolins in Asia have deteriorated significantly due to over harvesting for meat and medicine which has resulted in shifting poaching efforts to African pangolins to meet demand in Asia (Challender et al. 2016; Gomez et al. 2016). Exacerbating the issue is captive breeding of wildlife for commercial trade, such as tigers and bears, which is arguably of little conservation value as wild caught animals are known to be laundered and trafficked through such facilities, and further stimulates demand and trade in highly threatened species (Livingstone et al. 2018; Four Paws 2020; WFFT 2020).

Lesser-known species similarly exploited for the meat and medicine trade in Asia are porcupines. An increasing body of evidence reveals the heavy hunting and trade of porcupines in Asia that are resulting in population declines (Brooks et al. 2010; Lee et al. 2015; McEvoy et al. 2019; Yeung 2019; Loke et al. 2020). Wildlife trade surveys across markets in Southeast Asia have frequently encountered porcupines for sale including dead animals, live animals and body parts such as quills and bezoars (non–digestible food material that forms a stone like mass in the gut of an animal). Their meat is consumed as an alternative and important source of protein in parts of their range and their quills are used for decorative purposes. In traditional Chinese medicine, there is a particularly high demand for porcupine bezoar due to the perception that it has many healing properties (Brown 2015; Lee et al. 2015; Tan et al. 2019). A centuries old practice, the use of porcupine bezoars for medicine appears to have increased significantly in recent years (Lee et al. 2015; Heinrich et al. 2020a).

During a 2019 survey for porcupine bezoars on e-commerce websites in Indonesia, Malaysia and Singapore, 121 adverts selling approximately 680–1332 bezoars were obtained over a three-month period (Heinrich et al. 2020a). The majority of these adverts were located in Indonesia i.e. Kalimantan (Borneo), Java and Sumatra, although most of these occurred in Java. The study revealed the illegal exploitation of porcupines for bezoars both for domestic and international markets. This study takes a closer look at the trade of porcupines in Indonesia to assess the extent of the trade and whether it is a potential conservation concern that needs to be addressed.

Five species of porcupines exist in Indonesia–long-tailed porcupine (*Trichys fasciculata*) and Malayan porcupine (*Hystrix brachyura*) occur on the islands of Borneo and Sumatra, Sumatran porcupine (*H. sumatrae*), endemic to the island of Sumatra, Sunda porcupine (*H. javanica*) endemic to the islands of Java, Bali, Sumbawa, Flores, Lombok, Madura, and Tonahdjampea, and thick-spined porcupine (*H. crassispinis*) endemic to the island of Borneo (Figure 1). All five species are currently assessed as Least Concern by the IUCN Red List of Threatened Species with populations deemed stable with the exception of the Malayan porcupine which is described as having a decreasing population (Amori and Aplin 2016; Aplin 2016; Cassola 2016; Molur 2016; Lunde et al. 2016). That said, no population density details in any range state are provided in these assessments; just a line that describes the species as 'common and widespread' or 'common and prolific' or 'common in suitable habitat'. Further, no major threats to the species nor details on use and trade are listed. While hunting for food is described in parts of their range for the Long-tailed, Malayan and thick-spined porcupines, this is not thought to have a significant impact on populations.

Methods

I collected records of seizures and prosecutions relating to porcupine species in Indonesia for the period January 2013–June 2020. Data were extracted from the Indonesian government website, Sistem Informasi Penelusuran Pekara (SIPP) – an open access information database of the courts for each district in the country and from published online media articles. Searches for related seizures were conducted in both English (search terms: hunting, trapping, trade, illegal trade or wildlife trade in porcupine/*Hystrix*) and Indonesian (search terms: 'BKSDA', 'penyelundupan satwa landak/*Hystrix*', 'perdagangan satwa landak/*Hystrix*', 'polisi satwa landak/*Hystrix*', konservasi landak/*Hystrix*). All reported seizures were carefully checked to avoid duplication.

From each record obtained, I extracted information on date of seizure, species of porcupine seized, commodity (live animals, body parts, etc), quantities of each commodity, purpose of hunting/trade (i.e. for consumption, pets, trophies, etc), location of seizures and trafficking routes, suspects arrested and prosecution outcomes. Using this data, I have also mapped important trade hubs and centres where trade exists. Species identification is based on information extracted from seizure incidents obtained and it is assumed to be accurately reported. Generally, species identified as being seized fell within their distribution range in Indonesia with the exception of one incident where a live Sunda porcupine, which has a restricted distribution to Java and neighbouring islands, was reportedly seized from a 'wildlife recreational park' in West Kalimantan. I have conservatively estimated a minimum number of porcupines recorded in trade from commodities confiscated per seizure incident. Commodities seized generally consisted of live or dead animals and to a lesser extent, bezoar (assuming that one bezoar equates to one animal), and quills (3 incidents involving between 10 and 115 quills which I equate to being from one individual animal in each incident).

Results

From January 2013 to June 2020, I obtained 39 incidents in which porcupines were seized in Indonesia involving an estimated 454 porcupines (Figure 1). At least three species of porcupine were identified in 13 incidents – Malayan porcupine (8 incidents), Sunda porcupine (4 incidents) and Sumatran porcupine (1 incident). In the majority of incidents (67%) however, the species of porcupine involved was not identified/reported (Figure 1).

The most frequent and abundant commodity seized were of live animals (80% of incidents amounting to 429 estimated animals) (Table 1). To a much lesser extent, other commodities seized included quills (7% of incidents), dead specimens (5% of incidents) and in one incident each, meat (attached to skewers), bezoar stones and an internal organ (unspecified).

Of the 39 seizure incidents, 48.7% occurred in Sumatra, followed by Java and surrounding islands (43.6%) (Figure 2). In terms of quantity however, 89.6% of all commodities seized were in Sumatra, specifically involving the provinces of Aceh, North Sumatra and West Sumatra (Figure 2). A large number of incidents (n=12) that occurred in Sumatra involved targeted trading of porcupines (usually involving large numbers of porcupines i.e. on average approximately 32–33 animals per incident) where suspects were reportedly caught in the midst of transporting live porcupines from one location to another predominantly between Aceh, North Sumatra and West Sumatra; or local farmers/plantation owners caught trapping or in possession of porcupines intended to be sold to middlemen. In one incident which occurred in North Sumatra, it was reported that the seized animals (n = 56) were being transported to Aceh, from where they were to be shipped to China. In a few cases, porcupines were seized in general wildlife raids involving multiple species (3 incidents) such as bear and tiger body parts, dead pangolins or pangolin scales, muntjac, mousedeer, etc; or seized from individuals (3 incidents) that were keeping live wild animals without a legal permit including gibbons, sun bears, hawks, eagles, deer, crocodiles, etc.

In Java and surrounding islands, an estimated 44 porcupines were seized predominantly from individuals involved in the trade of live animals and parts (9 incidents, 13 estimated whole animals); or from individuals that were keeping/in possession of a

Table 1. Porcupine commodities seized per species from January 2013 to June 2020 and quantities seized in Indonesia.

Species	Seizures (#)	Estimated whole specimens	Commodity Seized					
			bezoar (piece)	dead (whole)	live (whole)	meat (skewers)	internal organ	quills
Unspecified	26	281	2	18	256	26	1	236
Malayan Porcupine	8	126			126			
Sumatran Porcupine	1	40			40			
Sunda Porcupine	4	7			7			
Total	39	454	2	19	429	26	1	236

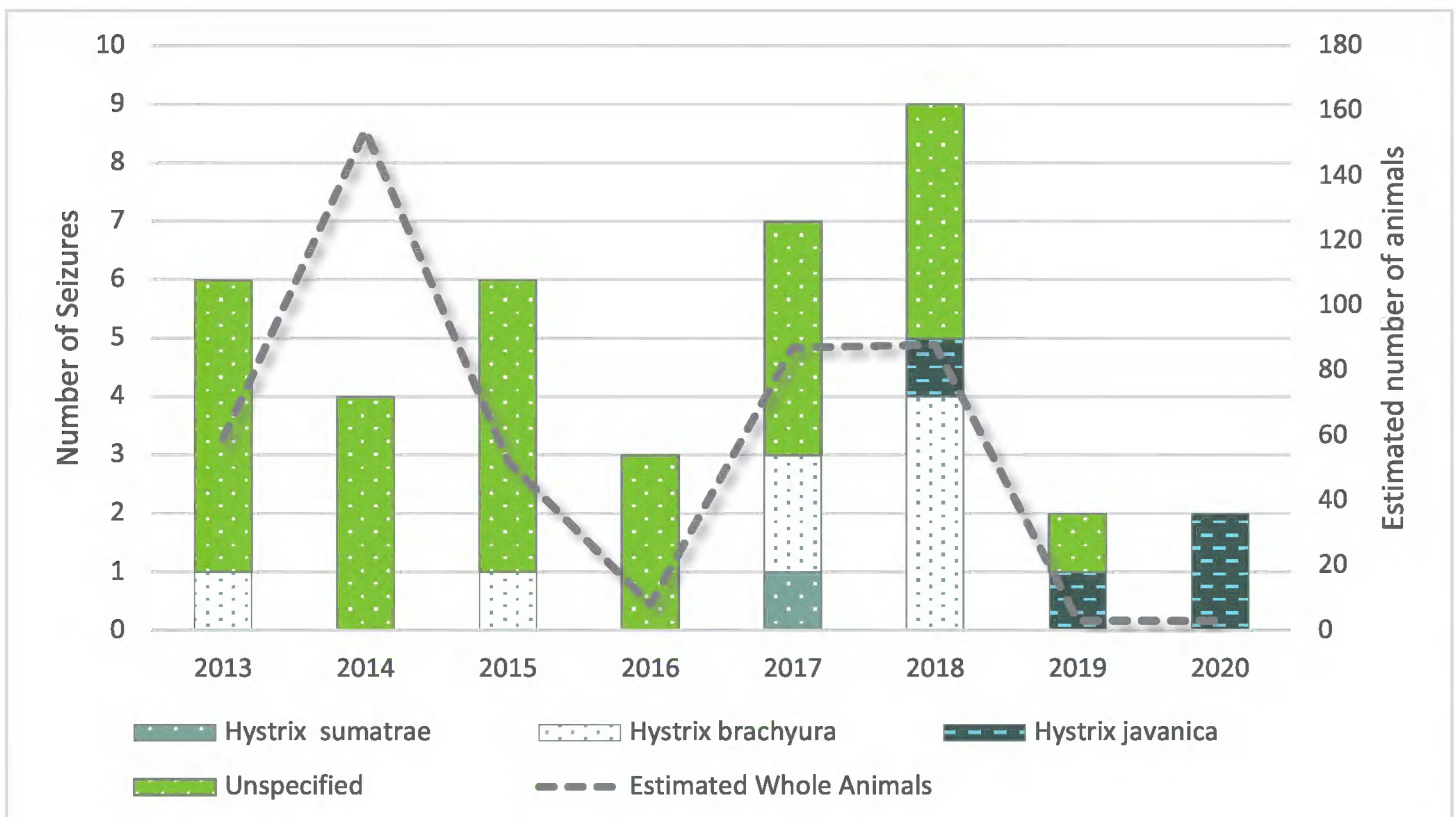

Figure 1. The number of seizure incidents involving porcupines in Indonesia from January 2013–June 2020, including species involved and estimated number of whole animals.

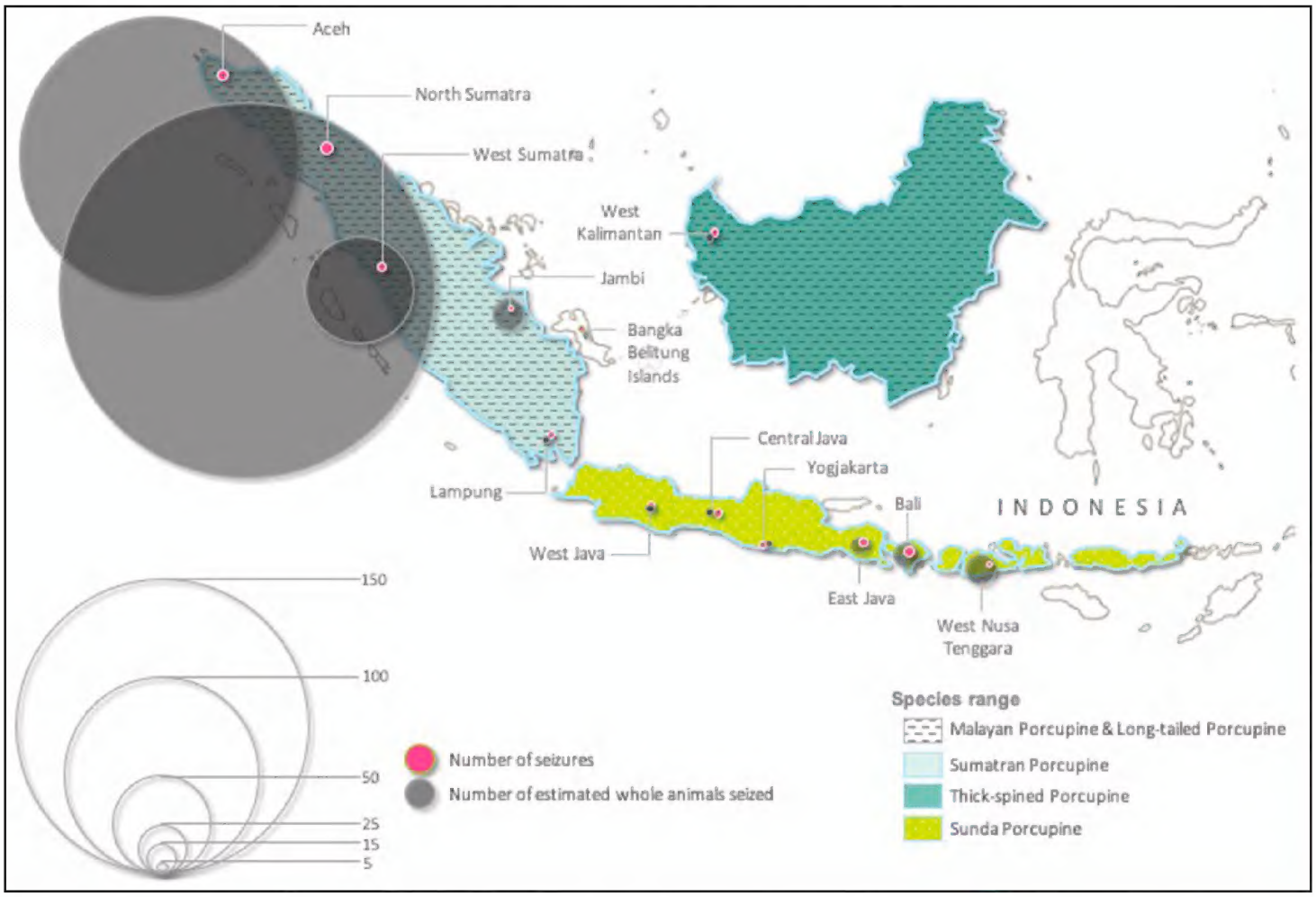

Figure 2. Location of porcupine seizure incidents by provinces in Indonesia including number of seizures at each location and estimated whole porcupines involved from January 2013 to June 2020; as well as the range of the five porcupine species that occur in Indonesia based on data extracted from the IUCN Red List of Threatened Species.

variety of wild animals without a legal permit (8 incidents, 31 estimated whole animals). Only in one of these incidents was it reported that a suspect was caught for illegally trapping and keeping wild porcupines which he subsequently used for breeding purposes.

There were only three incidents reported in Kalimantan (Indonesian Borneo) amounting to an estimated three porcupines (~2 live animals and 111 quills). In two incidents individuals were caught running a wildlife animal park/ mini zoo without a valid permit and involved multiple species including sun bears, birds, deer, slow loris, binturong, crocodiles, etc; and in one incident an accessory shop was raided and found to be illegally trading in protected wildlife parts including orangutan, sun bear, hornbill, muntjac, pangolin, sea turtles, deer and porcupine.

Discussion

Species in trade and legislative loopholes

In the majority of incidents (67%), despite predominantly involving live animals, the species of porcupine seized was not reported making it difficult to determine if specific species are being targeted or whether all species are exploited for trade. However, at least three species were seized which seems to suggest the latter. Further, considering the over-lapping distribution range of the various species (with the exception of the Sunda porcupine), it is safe to assume that trade could potentially encompass all five species. That said, studies have shown that the Malayan porcupine is likely the main species found in trade in Asia primarily due to its wide distribution (Heinrich et al. 2020a, b). The Malayan porcupine was the most frequently identified species confiscated between 2013 and 2018 (in 13 incidents). After 2018, there were fewer porcupine seizures and these incidents either involved the Sunda porcupine or it was unreported (Figure 1).

This can likely be explained by the protection status of different porcupine species in Indonesia. The Act of the Republic of Indonesia No.5 of 1990 concerning conservation of living resources and their ecosystems, widely known as the Conservation Act (No.5) 1990, is the principal legislation pertaining to the regulation of wildlife trade in Indonesia. Under this Act, species are categorized as "Protected" or "Unprotected". Protected species are prohibited from being caught, injured, killed, kept, possessed, cared for, transported, or traded whether alive or dead, unless permitted by the Government; and are listed under Government Regulation No.7, 1999, Concerning the preservation of flora and fauna. Prior to 2018, the only porcupine species protected in Indonesia was the Malayan porcupine. The only time the protected species list has been revised, since it was gazetted, was in 2018, first in July and then again in September the same year. The amendments included the removal of the Malayan porcupine and the addition of the Sunda porcupine. Since then, seizures of the Malayan porcupine have not been reported. Removal of the Malayan porcupine from the protected species list is highly questionable considering it is the species most frequently confiscated and perhaps this is another indication of the lack of political will to combat the

trafficking of wildlife of commercial value. For example, the Indonesian government revising the protected species list twice within months of release in 2018 was the result of pressure from bird traders to remove certain species that were newly added to the list due to significant population declines (Armstrong and Chng 2020). Calls for stronger protection of otters in Indonesia for similar reasons led to the protection of the Smooth-coated Otter but not the Small–clawed Otter, the species most exploited for domestic and international commercial trade (Gomez and Bouhuys 2018; Gomez and Shepherd 2018).

Technically, the trade and collection of unprotected species in Indonesia is regulated by harvest quotas that are established annually under the Decree of the Minister of Forestry Number 447/Kpts-II/2003 concerning the administration directive of harvest and capture and distribution of the specimens of wild plant and animal species. For the duration of this study period (2013–2020) no harvest quotas were established for the five porcupine species found here and therefore any porcupine in trade are of illegal origins. Having said that, there are no provisions in any of these laws regarding penalties or fines against those violating harvest quotas or/and trading in unprotected species, rendering enforcement action pointless. Notably, porcupine seizures in Indonesia peaked in 2018 with nine seizures (involving an estimated 88 animals) and subsequently dropped to two seizures in 2019 (involving an estimated 3 animals). The inadequate regulation of harvest quotas has been raised countless times with regards to Indonesian species in trade and is seen as a deliberate impediment to conservation of its species (Gomez and Bouhuys 2018; Janssen and Chng 2018; Armstrong and Chng 2020; Latinne et al. 2020; Janssen and Gomez 2021). A clear example of this is the hunting and trade of Tokay geckos (*Gekko gecko*) in Indonesia – whereby studies have shown established harvest quotas being greatly exceeded and fraudulent captive-breeding claims through the years (Caillabet 2013; Nijman and Shepherd 2015). Due to declining populations throughout its range, in 2019 the Tokay Gecko was added to Appendix II of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) in a bid to regulate and monitor international trade. Following this, the Indonesian government significantly increased harvest quotas in 2020, from 50,000 individuals/year prior to 1,800,000 individuals/ year, not only undermining conservation efforts but showcasing the dubious nature in which harvest quotas are determined (Janssen and Gomez 2021).

Porcupine use and trade hotspots

This study revealed a local demand for live porcupines and their parts. In one incident, actual porcupine meat on skewers was seized. Locally, porcupine meat is consumed as an alternative source of protein, as a medicinal cure for asthma and improving one's vitality, and as an aphrodisiac (Farida 2013; Farida 2015; Mustikasari et al. 2019; Nurliani et al. 2020). Quills were seized in three separate incidents in Aceh, Bali and West Kalimantan. These are reportedly used in local traditional medicine, as hairpins by pregnant women, and as souvenirs or talismans against black magic

(Mustikasari et al. 2019). Live porcupines were also confiscated from privately run wildlife/recreational parks or mini zoos along with a host of other protected species due to the lack of a valid permit to either operate such facilities or for possession of protected species. This was particularly evident in Java. Trade of porcupines for traditional medicine use was also evident in two seizure cases in West Sumatra. In one incident, porcupine bezoars were confiscated along with tiger and bear body parts that were reportedly bought from traders around Medan. In another incident, involving 64 live pangolins, the suspect arrested confessed to keeping porcupines in stressful conditions to induce the formation of bezoars which takes place after approximately 6–7 months at which point the porcupines are killed, the bezoar extracted and sold for IDR150K (~USD11). While there were few seizures involving porcupine bezoars, Heinrich et al. (2020a), found a substantial number of porcupine bezoars for sale online in Indonesia. Based on seller location obtained, the majority of these were in Java (31 listings), followed by West Kalimantan (12 listings) and Sumatra (9 listings).

There was also evidence of targeted hunting of porcupines for commercial international trade, predominantly in Sumatra. In an incident that occurred in the province of North Sumatra, 56 live porcupines were seized. According to the suspects arrested, they were hired to transport the animals to Aceh from where they would then be shipped to China. This confirms previous anecdotal information concerning porcupines being shipped to China from Indonesia and other countries in Southeast Asia (C.R. Shepherd, pers. comm). Further, incidents in the provinces of Aceh, North Sumatra and West Sumatra, where the greatest number of porcupines were seized (on average approximately 32–33 animals per incident), have frequently revealed these areas to be important wildlife trade hubs where animals are smuggled out of Indonesia (USAID 2015; Tankandjandji and Sawitri 2016; Gomez et al. 2017). According to USAID (2015), there was a noticeable increase in poaching activities within Kerinci Seblat National Park in Sumatra around 2010 onwards reportedly driven by export markets. Porcupines were among the animals in demand, aside from tigers, Helmeted Hornbills and, pangolins. Heinrich et al. (2020a) also note the international nature of the trade in porcupine bezoars with ~20% of online adverts selling porcupine bezoars, offering international shipping. As none of the porcupine species native to Indonesia are listed in the appendices of the CITES, there is no data available for international trade, making it nearly impossible to monitor trade, regulate international trade and identify trends of concern.

Conservation implications

What clearly emerges from this study is that porcupines are being illegally hunted and exploited throughout their range in Indonesia for local subsistence and commercial trade. While it is difficult to determine the impact this has on porcupine populations, reports in Indonesia indicate the species are in decline due to habitat loss and conversion as well as uncontrolled poaching (Salviana et al. 2017; Farida et al. 2019; Mustikasari et al. 2019). Similar declines in porcupine populations due to over-hunt-

ing have been documented in other parts of their range including Malaysia (Loke et al. 2020), Myanmar (McEvoy et al. 2019), Singapore (Chung et al. 2016) as well as Vietnam and Lao PDR (Brooks et al. 2010). In Cambodia, porcupines are amongst the most frequently confiscated animals (Heinrich et al. 2020b). In Vietnam, porcupines are highly coveted for consumption which has decimated porcupine populations throughout the country (Brooks et al. 2010). Additionally, captive-breeding facilities were found to be laundering and trafficking wild animals causing local extirpations; and shifted poaching efforts to neighbouring Lao PDR to compensate for this (Brooks et al. 2010). Chevallier and Ashton (2006) note that the Cape porcupine in South Africa is widespread and easily adaptable to habitat changes and disturbances, but that this has contributed greatly to its demise as over the years it has come into increasing contact and therefore conflict with humans. Much the same is noted for the Sunda porcupine in Java (Mustikasari et al. 2019). Porcupines are also persecuted as agricultural pests, leaving them further exposed to wildlife traffickers taking advantage of these situations to procure animals for trade. Based on four seizure incidents, farmers or plantation owners were reported to be hunting and trapping porcupines to sell. In one of these incidents, a wildlife trader was arrested for smuggling 20 porcupines he had bought from plantation owners around West Aceh for IDR200K (~USD14)/animal and resold them at IDR450K (~USD32)/animal. He also provided traps for this purpose and asserted that porcupines had becomes pests destroying farmer's; oil palm plantations and would have been killed regardless. In another incident in West Sumatra, an individual was arrested for illegally trading porcupines he caught in his corn field near a forested area using ripe jackfruit as bait. This is concerning as, with the exception of the Malayan porcupine which has a wide range throughout much of Asia, the remaining four species have a more restricted range including three island endemics, the Sumatran porcupine, Sunda porcupine and thick-spined porcupine placing them at higher risk from unsustainable hunting and trade.

Commercialisation of the meat and traditional medicine trade is a key driver of species decline on a global scale (Shairp et al. 2016; Nijman and Bergin 2017; D'Cruze et al. 2020; Stanford et al. 2020; WAP 2020). In Indonesia, this has already resulted in the (near) depletion of several species encompassing tigers, pangolins, reptiles, freshwater turtles, etc (Lyons and Natusch 2011; Auliya et al. 2016; Shepherd et al. 2016; Janssen and Chng 2018; Morgan 2018; Wong and Krishnasamy 2019; Nijman et al. 2019; Rheint et al. 2019; Latinne et al. 2020, Shepherd et al. 2020). Lesser-known species are particularly vulnerable as trade often goes undetected (Alves et al. 2008; Nijman and Bergin 2017; Symes et al. 2018; Janssen and Gomez 2019; Janssen and Gomez 2021). Similarly, the commercial international trade in non-CITES listed species is also poorly documented, regulated or monitored; and this data gap presents a considerable conservation risk as understanding trade dynamics and its impact on these species is extremely difficult. A case in point - a study examining the trade of live reptiles from Indonesia to the US found that more than three quarters of exports were of non-CITES listed species than CITES listed species and encompassed nationally protected and endemic/range restricted species (Janssen and Gomez 2021).

Conclusion

As porcupines face a multitude of threats – habitat loss, retaliatory killings, targeted hunting for commercial trade – it is crucial that all porcupines be listed as protected species under Indonesian wildlife laws to improve regulation and enforcement against illegal trade. Greater resources should also be channelled to improving wildlife regulations, enforcement and scrutiny relating to the uptake of wild animals including species currently without formal protection. A thorough examination of the commercial trade of porcupines is warranted so that appropriate mitigation measures can be developed to protect porcupines from unsustainable and illegal exploitation. More in–depth research is similarly needed to understand porcupine population dynamics in Indonesia to improve understanding of their conservation status, to assess and establish harvest quotas essential for ensuring sustainable trade, and in general to monitor the overall impacts of commercial trade on wild populations. Echoing Heinrich et al. (2020a), greater efforts are also needed to monitor and regulate the international trade in porcupines. Listing these species in Appendix II of CITES should be considered as another means to potentially achieve this as it would require any international trade to take place through a supervisory system which would allow for regulation, and opportunities to track and analyze trends, thus providing an early warning system should wild populations begin to decline.

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